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**NOTES ON SALMONOID AND RELATED FISHES**

BY HENRY W. FOWLER.

The Salmonoidea and Iniomi in the collection of the Academy of Natural Sciences of Philadelphia are listed in this paper, as many have not been recorded before or show interesting localities in their distribution. Three species, apparently new, are described.

**SALMONIDÆ.**

*Coregonus quadrilateralis* Richardson.

One from "Lake Superior."

*Coregonus fera* (Jurine).

One labeled "Italy," identified by Bonaparte with this species, may have been taken in the Swiss lakes?.

*Coregonus marænula albellus* (Fatio).

Two from Lake Lucerne. One without data labeled "Italy" (Bonaparte) may have been taken in Switzerland?.

*Coregonus wartmanni* (Bloch).

One labeled "Italy" (Bonaparte) probably from Switzerland?.

*Coregonus wartmanni nobilis* (Haack).

Two from Lake Lucerne.

*Coregonus olupeaformis* (Mitchill).

One from Lake Champlain and three others from Lake Superior, Lake Michigan and Georgian Bay, respectively.

*Coregonus albus* Le Sueur.

I examined a number at Erie, Pa., taken in Lake Erie during July of 1907. One now in the Academy.

*Leucichthys artedi* (Le Sueur).

Abundant at Erie, Pa., in Lake Erie in July, 1907, where I examined many. Several were secured and are now in the Academy. Four small examples without data and an adult from Lake George.

*Leucichthys eriensis* (Jordan and Evermann).

One from Lake Superior at Port Arthur, which agrees with

the original account. This species was described from the north shore of Lake Erie, and said to be occasional in Lake Huron, but unknown in Lake Superior. Its equal jaws seem to be a good character.

**Leucichthys prognathus** (H. M. Smith).

One from Milwaukee, Wis.

**Leucichthys nigripinnis** (Milner).

One from Milwaukee, Wis.

**Leucichthys albula** (Linnæus).

One labeled "France" most likely from Scandinavia.

**Oncorhynchus kisutch** (Walbaum).

Four from Alaska; one from the Frazer River in British Columbia, and six from Osatsuba in Japan.

**Oncorhynchus tshawytscha** (Walbaum).

Two probably from the Columbia River?, another from the McCloud River in California, and one from Silver Lake Camp in Maine (introduced).

**Oncorhynchus nerka** (Walbaum).

One from Alaska and one from Kootenay Lake at Nelson in British Columbia.

**Salmo salar** Linnæus.

Three labeled "Europe," two without data, and two from the St. Croix River in Maine.

**Salmo salar lacustris** (Linnæus).

Two from Italy, according to the Bonaparte Catalogue "lago Maggio."

**Salmo eriox** Linnæus.

Five from Italy, of which one dried. A large one from Tasmania (introduced).

**Salmo fario** Linnæus.

A number of examples from France, Switzerland and Italy, others labeled "Europe." One from Lake Lucerne.

**Salmo perryi** Brevoort.

One from Nikko, Japan, and in each gill-opening a number of parasitic crustacea.

**Salmo mykiss** Walbaum

One from Alaska.

**Salmo clarkii** Richardson.

One from Puget Sound.

**Salmo clarkii lewisi** (Girard).

*Salmo carinatus* Cope, Rep. Geol. Surv. Hayden, 1871, p. 471. Locality unknown, perhaps Yellowstone Geyser basin.

Nos. 7,835 and 7,836, A. N. S. P., cotypes of *S. carinatus* Cope. Also example with deformed snout probably this species.

**Salmo clarkii virginalis** (Girard).

One labeled "Buffalo Co., California," likely an error?.

**Salmo clarkii pleuriticus** (Cope).

*Salmo pleuriticus* Cope, Rep. Geol. Surv. Hayden, 1871, p. 471. Heads of Green River, Medicine Lodge Creek, Idaho. The Junction, Montana.

No. 16,472, A. N. S. P., cotype ? of *S. pleuriticus* Cope.

**Salmo clarkii stomias** (Cope).

*Salmo* (*Salar*) *stomias* Cope, Rep. Geol. Surv. Hayden, 1870, p. 433. Fort Riley, Kansas.

Nos. 7,825 and 7,826, A. N. S. P., cotypes of *S. (S.) stomias* Cope.

One probably from Kansas? and one from the North Fork of Saint Vrain Creek in the S. Platte River basin, Boulder County, Colo. Also three small ones from Ute Creek at Camp Garlan in the Canadian River basin in Union? County, N. Mex.

**Salmo rivularis** Ayres.

One from the Chewauca River, Oregon.

**Salmo irideus** Gibbons.

One from the Russian River, California.

**Salmo irideus gilberti** (Jordan).

Two from the Kern River and one from Kern Lake, California.

**Salmo irideus roosevelti** (Evermann).

*Salmo roosevelti* Evermann, Bull. U. S. Bur. Fisher., XXV, 1905, p. 26, Pl. 1. Volacano Creek, California.

No. 38,036, A. N. S. P., paratype of *S. roosevelti* Evermann.

**Salmo irideus whitei** (Evermann).

*Salmo whitei* Evermann, Bull. U. S. Bur. Fisher., XXV, 1905, p. 20, Pl. 16. Coyote Creek, California.

Nos. 38,037 to 38,039, A. N. S. P., paratypes of *S. whitei* Evermann.

**Salmo irideus shasta** (Jordan).

One from the Middle Fork of the Tule River and another from the McCloud River, California.

**Salmo irideus agua-bonita** (Jordan).

One from the South Fork of the Kern River, California.

**Hucho hucho** (Linnaeus).

One labeled "Europe."

**Hucho blackistoni** (Hilgendorf).

One from the Ishikari River near Sapporo, Japan.

**Salvelinus fontinalis** (Mitchill).

I have examined many examples from: ? young from Marguerita River, lower Canada; Pierce Pond in Somerset County, Me.; Lake George, N. Y.; Morris County, N. J.; Port Kennedy, Loyalsock Creek, Newton Hamilton, Newgarden, Bridgeport, Indiana County and Warren County in Pa.; head of the James River, Little Stony Creek and Walker's Creek, Va.; Lake Superior; Milwaukee, Wis. Besides these two others, of which one dried.

**Salvelinus malma** (Walbaum).

*Salmo tudes* Cope, Proc. Amer. Philos. Soc., XIII, 1873, p. 24. Captain's Harbor, Unalaska.

Nos. 7,847 and 7,848, cotypes of *S. tudes* Cope.

Another obtained by Dr. Benjamin Sharp on June 11, 1895, at the same locality, two from St. Paul on Kadiak Island, badly preserved, and one from "Alaska."

**Salvelinus alpinus umbla** (Linnaeus).

One from Italy, one from France and one without data a dried skin.

**Salvelinus alpinus willughbii** (Günther).

One from Lake Windermere.

**Salvelinus alpinus perisii** (Günther).

One from Wales.

**Salvelinus alpinus killinensis** (Günther).

Scotland, one example.

**Salvelinus alpinus stagnalis** (Fabricius).

One from Holstensborg and another from Godhavn, Greenland.

**Salvelinus oquassa** (Girard).

One from the Rangeley Lakes in Maine, one from New York and another without data.

**Salvelinus oquassa marstoni** (Garman).

One from Lake Cassette, Riwouski in Quebec, Can.

**Cristivomer namaycush** (Walbaum).

Four from Milwaukee, Wis.

**Plecoglossus altivelis** Schlegel.

Nine from Morioka, one from Tsuruga and four from Kurume, Japan.

**THYMALLIDÆ.****Thymallus thymallus** (Linnæus).

Two from Italy and one from France.

**Thymallus tricolor** Cope.

Proc. Acad. Nat. Sci. Phila., 1865, p. 80. Au Sable River, Michigan.

No. 7,796, A. N. S. P., type.

Another from the Au Sable River and a dry skin from Michigan.

**ARGENTINIDÆ.****Mallotus villosus** (Müller).

Two from Groswater Bay, Labrador; one from Wood's Holl in Mass., and three labeled "North America."

**Thaleichthys pacificus** (Richardson).

One from the Frazer River in British Columbia and another from the Naas River in Oregon.

**Osmerus eperlanus** Linnæus.

*Osmerus sergenti* Norris, Proc. Acad. Nat. Sci. Phila., 1868, p. 95. Schuylkill River, Philadelphia.

Nos. 7,751 to 7,753, A. N. S. P., cotypes of *O. sergenti* Norris.

Two examples from France do not differ in any way from American specimens from: Mt. Desert, Me.; Boston, Nahant and Wood's Holl, Mass.; Long Island, N. Y.; Jersey City, the Delaware and Raritan Rivers, N. J. The alleged greater number of scales for the latter, also the supposed shorter gill-rakers and weaker teeth are evidently fallacious. I shall therefore be obliged to follow Smitt in allowing them identical.

**Osmerus thaleichthys** Ayres.

One from Monterey, Cal.

**Mesopus pretiosus** (Girard).

One from Puget Sound.

**Mesopus olidus** (Pallas).

Twenty-eight from Aomori, Japan. Jordan and Snyder state that *M. japonicus* (Brevoort) differs in having the ventral inserted below the second or third dorsal ray, D. 10 and A. 12 or 13. All of these characters are found in at least some of my examples of the present species, none of which are over  $2\frac{5}{8}$  inches, and in many cases the afore-mentioned characters are found in combination with those of undoubted examples of *M. olidus*.

*Argentina sphyraena* Linnæus.

Seven from Italy.

#### MICROSTOMIDÆ.

*Microstoma microstoma* (Risso).

Four from Italy.

#### SALANGIDÆ.

*Salanx hyalocranius* J. F. Abbott.

Proc. U. S. Nat. Mus., XXIII, 1901, p. 490, fig. Tien Tsin, China.

Nos. 26,800 to 26,840, A. N. S. P., paratypes.

#### STOMIATIDÆ.

*Stomias bonapartei* sp. nov. Fig. 1.

*Stomias barbatus* Bonaparte, Icon. Faun. Ital., Pesc. III, pt. 1, XXX, 1841, descr., Pl. fig. 3. Sicily. Probably not of Cuvier.

Head  $7\frac{3}{4}$ ; depth about 9; D. III, 9?; A. III, 14; P. I, 6?; V. I, 5; scales (according to pockets) about 77 in lateral series to caudal base; about 8? scales (pockets) in transverse series, at centre of abdomen; about 70? vertebræ according to myocommas; head width about  $2\frac{1}{4}$  its length; head depth at occiput  $1\frac{1}{2}$ ; snout  $4\frac{2}{3}$  in head measured from upper jaw tip; eye 4; maxillary  $1\frac{1}{10}$ ; inter-orbital 4; lower caudal lobe  $1\frac{1}{2}$ ; pectoral  $2\frac{1}{2}$ ?; ventral  $2\frac{1}{2}$ ?; front longest anal ray  $2\frac{1}{4}$ ?

Body very elongated, greatly compressed, edges apparently somewhat trenchant?, and sides flattened. Trunk constricted at neck, abdomen with swollen appearance and thus forming greatest depth. Caudal peduncle compressed, its least depth about 2 in its length.

Head compressed, deep, upper profile horizontal and a little convex, lower more inclined and a little convex, sides flattened. Snout short, evidently with surface convex, length about  $\frac{2}{3}$  its width. Eye rounded, near first third in head close to upper profile. Maxillary slender, extends far back nearly to hind preopercle edge. Pre-maxillary toothed, with five large slender curved thin fangs, second fang longest and fourth larger than others. Last  $\frac{2}{3}$  of lower maxillary edge finely toothed, denticles very small, of about uniform size, and all directed posteriorly. On each side of vomer a large slender sharp fang, and behind each also another similar pair, but so approximated that their tips cross. Still posterior and external to latter also another shorter fang, similarly directed, though each one much smaller. Along mandible edges 9 + 8 fangs, as 2 small ones at each side of symphysis, then larger curved fang, then little shorter

curved fang, alternately followed by short curved fang, then larger fang, then (asymmetrical on left side 2) small tooth, finally still smaller one. Tongue not differentiated from base of hyoid arch. Mandible with rami low, well curved up in front where also tapering in thickness, and extended back behind as short angular process. Nostrils close before eye?. Interorbital broad, slightly convex. Preopercle edge curved back convexly. Opercle small, not quite large as eye.

Gill-opening forward before eye, about midway in snout. Rakers conic, strong, sharp-pointed, only on ceratobranchial, as 9 graduated

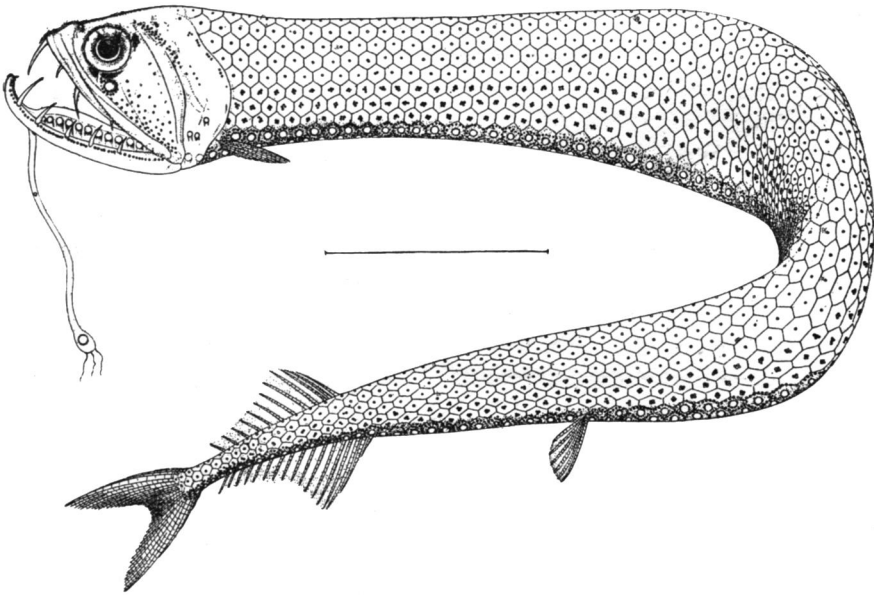


Fig. 1.—*Stomias bonapartei* Fowler. Type.

denticles, anteriorly largest, of which first a cluster of 4 graduated cusps with last longest and curved back, second of 2 cusps with first longer and curved forward, third of 2 cusps with second longer and curved back, and third smaller, of 3 graduated cusps with last longest, though all directed back. Largest rakers about size of symphyseal teeth. Filaments about equal longest rakers. Pseudo-branchiæ absent. Isthmus long, slender, narrowly constricted. Branchiostegals 17 each side, short, slender, of about uniform length, except shorter or graduated down at each end of hyoid arch.

Scales deciduous? (entirely fallen from my example), but appar-



ently of hexagonal shape, thin and smooth, disposed in even longitudinal series, of nearly uniform size and but little crowded on caudal peduncle. Head, caudal and fins naked. Long hyoid flattened filament equal to about  $1\frac{1}{2}$  times head in length, slightly expanded at end within which a photophore, and terminated by 3 short thin filaments, longest of which not quite equal to eye. Two smaller photophores at lower basal surface and another about first fourth in length of hyoid filament. Two? (at least one) rather large photophores, their diameter less than 4 in eye, just below and close to latter. Behind eye and just above maxillary concurrently on cheek, 2 rows of quite small photophores, these continued up concurrently with preopercle edge to supra-postocular region. Within lower triangle of cheek also numerous small photophores, like those just described, though becoming sparse toward eye. Along outer mandibular edge series of small photophores where anteriorly they are interrupted by fangs. Within branchiostegal membrane between bases of each branchiostegal ray, a large photophore, though none so large as infraorbital. Three similar photophores at lower posterior articulation of opercle. About 10 pairs of similar large photophores along isthmus. Along ventral edge of entire trunk length 2 rows of large photophores, apparently 1 in centre of each scale, and extending back to caudal base, though only a single series after ventrals and along lower caudal peduncle surface. Each scale (according to pocket) with at least 1 small photophore medianly on dorsal region, though below vertebral axis anteriorly on costal region each scale with a median cluster of at least 4 minute photophores. Posteriorly on body laterally, as above ventral base cluster reduced to 3 photophores and in region above anal only 2 photophores. Along side of caudal peduncle almost all photophores single. Over abdominal scales very numerous small photophores, mostly arranged as marginal series, or at least as reticulations, around larger photophores.

Dorsal origin a trifle before last seventh in space between caudal base and mandible tip, base apparently little shorter than that of anal (fin damaged). Anal inserted apparently before dorsal origin, rays graduated up to fourth, after which all a little shorter (damaged). Caudal distinctly forked nearly a third its length, and lobes apparently pointed sharply. Pectoral short (damaged), inserted low. Ventral inserted about last third in space between pectoral origin and caudal base, fin short (damaged). Vent apparently close before anal.

Color in alcohol pale or dull brownish, largely uniform, photophores all paler or whitish. Abdominal edge and isthmus all dusky or blackish, photophores conspicuously white with black pigment about their edges. All photophores with deep brown edges. Fins pale or whitish-brown. Iris slaty.

Length  $6\frac{3}{4}$  inches.

Type, No. 7,955, A. N. S. P. Italy. C. L. Bonaparte, No. 349. From Dr. T. B. Wilson.

The above-described example apparently represents a rare species entirely distinct from any in the genus *Stomias*. Several authors<sup>1</sup> have recently<sup>2</sup> confounded it with *Stomias boa* (Risso). It differs from that species, however, in many respects. *S. boa* is said to have the upper jaw furnished with 8 separated unequal curved teeth, and those on the premaxillaries small. It is also said to have the mandible well protruded and furnished with 14 curved teeth, and the ventrals very long and filiform. Risso's rude figure<sup>3</sup> shows them about the last third in the space between the hind eye edge and the caudal base, and if depressible but little short of the anal origin. Risso also shows the caudal greatly forked, no barbel, and only about 3 teeth in each jaw. Valenciennes, in giving a detailed account<sup>4</sup> of the *Esox boa* Risso, shows the type of Cuvier's genus *Stomias* to have been based on Risso's specimen. *Stomias barbatus* Cuvier<sup>5</sup> was surely an unsatisfactory species, distinguished from *S. boa* by the supposed difference in having a hyoid barbel or filament, the latter having been entirely overlooked in *S. boa*. Cuvier's account is thus very incomplete and unsatisfactory, merely a line of valueless diagnosis, and must therefore be submerged in the synonymy of *Esox boa* Risso. For these reasons I have been obliged to rename the present species. Günther very properly allowed the Bonaparte species as distinct, and the subsequent confusion with *S. boa* (Risso) may have been due to Moreau's remarks.<sup>6</sup>

I may here note that *Stomias* dates from Oken,<sup>7</sup> Cuvier's account<sup>8</sup> being in the vernacular, and the type *Esox boa* Risso.

The accompanying figure is somewhat restored, and for this allowance must be made.

(Named for Charles Lucien Bonaparte.)

<sup>1</sup> *Ocean. Ich.*, 1895, p. 106, Pl. 34, fig. 28.

<sup>2</sup> *Wiss. Ergeb. Deutsch. Tiefs. Ex.*, XV, 1906, p. 49.

<sup>3</sup> *Hist. Nat. Eur. Mer.*, III, 1826, p. 440, Pl. 16, fig. 40.

<sup>4</sup> *Hist. Nat. Poiss.*, XVIII, 1846, p. 273, Pl. 545.

<sup>5</sup> *Règne Animal*, Ed. 2, II, 1829, pp. 283, 284.

<sup>6</sup> *Hist. Nat. Poiss. France*, III, 1881, p. 490.

<sup>7</sup> *Isis*, 1817, p. 1183.

<sup>8</sup> *Règne Animal*, II, 1817, p. 184.

## CHAULIODONTIDÆ.

*Chauliodus sloani* Schneider.

Head 5; depth (of head) about 7; depth (at dorsal origin) about 13; D. 6; A. 12; P. 15; V. I, 5; scales about 52 (according to pockets and pigment spots) in median lateral series; about 7 scales in transverse series (pockets) at dorsal origin; about 5 scales in transverse series between adipose dorsal origin and that of anal (pockets counted); head width about 3 in its length; head depth at occiput about  $1\frac{1}{8}$ ; mandible  $1\frac{1}{8}$ ; rayed dorsal base 3; anal base 2; lower caudal lobe (damaged) about  $1\frac{3}{4}$ ?; pectoral (damaged) about  $1\frac{1}{2}$ ?; snout 4 in head measured from upper jaw tip; eye 4; maxillary  $1\frac{1}{10}$ ; interorbital  $4\frac{1}{3}$ ; anterior mandibular fang  $1\frac{1}{4}$ .

Body greatly elongated, slender, tapering evenly back to caudal base from head, at which point greatest depth, sides compressed and edges rounded. Caudal peduncle slender, compressed, its least depth  $2\frac{3}{4}$  its length.

Head compressed, deep, obtuse in front, flattened sides not converging above or below, upper profile a little convex and lower nearly horizontal. Snout short, ending in short obtuse constricted process, about broad as long. Eye circular, anterior about first third in head length near upper profile, which deeply concave in course just before eye. Mouth very large, not completely closing, with upper jaw edge well inclined and lower jaw edge nearly horizontal. On each side of upper jaw anteriorly, or in premaxillary, first tooth slender, simple, thin, slightly curved and awl-shaped. Second tooth longer and stouter with an obsolete terminal barb, third similar to second, but shorter than first, and fourth like third only trifle longer, but not long as first. Maxillary with a series of compressed short attenuated teeth along lower edge, graduated to first third, after which of about uniform length. Maxillary extends obliquely down straight to mandible articulation or hind preopercle edge. Mandible with 7 pairs of large canines, first enormous, slender, curved slightly back, and when mouth closes extend up along each side of snout well above upper eye edge, tip of each with small barb behind. Second pair simple and slender, about  $\frac{1}{4}$  length of first. Third trifle curved back at tip, about half length of first, others all graduated down smaller than second and similar. In upper jaw on left side directly after base of first canine another, but depressible transversely across roof of upper jaw. A similar and slightly longer one behind base of second right canine. Each palatine with 7 short conic straight teeth, first about  $\frac{1}{8}$  length of

first premaxillary fang, and others all graduated down till minute. No other teeth on roof of mouth. Tongue small, bony, not free, with median osseous keel. Nostril simple pore close before front orbital edge. Mandible large, greatly compressed, rami not elevated in mouth, conic process at symphysis, and slight flange along lower external edge of each branch. Interorbital depressed, and like rest of cranium bones thin. As viewed from above, brain easily distinguished through thin cranial walls. Along each side of head above an osseous keel. Opercle narrow, deep. Subopercle smaller than eye. Hind preopercle edge slightly convex, inclined down behind.

Gill-opening forward about opposite first third in snout. Rakers about  $4 + 15$  minute firm pointed denticles along inner edge of gill-arch. Filaments  $1\frac{3}{4}$  in eye. No pseudobranchiæ. Branchiostegals about twenty each side, mostly uniform, short, slender, only little shorter each end. Isthmus long, slender, compressed narrowly and scarcely tapering back behind.

Scales small, thin, smooth, mostly all fallen, and now distinguished only from pockets as apparently of mostly uniform size and disposed in several even longitudinal series. Head and fins entirely naked. A single crescentic series of small infraorbital photophores, first largest and begins in small dark pigment blotch opposite front edge of eye, and entire series close to eye. Below this directly opposite eye centre close to maxillary edge a rather large and conspicuous photophore. Along outer surface of maxillary medianly and continued well down its course a single series of small photophores, anteriorly quite small and enlarged a little posteriorly. In lower corner of cheek a series of 5 photophores, and opposite just behind preopercle edge another photophore. Behind upper edge of preopercle articulation a large photophore, and still another at lower edge of subopercle. A rather large photophore between base of each branchiostegal ray on branchiostegal membrane. On inner surface of preopercle, within gill-opening, a series of small photophores close together. Photophores from isthmus to pectoral 11, from pectoral to ventral 19, from ventral to anal 25, from anal to caudal 10. Abdominal photophores as double median row, and another row each side, preventral 19, postventral 26, though median double row with series very close. Upper row well separated and along parallel in space below, or between it and lower series, a parallel series of numerous minute or close-set photophores. This series disappears at anal, likewise median double series. Along anal base

each side a series of about 12 rather small photophores. On lower caudal peduncle surface a series of minute photophores. On pre-dorsal region of trunk a pair of minute photophores, close together medianly within each scale pocket. On rest of trunk usually a single minute median photophore, though within median lateral series, apparently 2 sometimes, and some of pockets medianly along caudal peduncle sides even with a cluster of 3. At base of lower caudal lobe medianly 3 small photophores in a series. No evidence of l. l. About 6 or more photophores in row medianly a little anterior on inner branchiostegal membrane.

Dorsal origin inserted about first  $\frac{2}{7}$  in head and trunk length, base well elevated, apparently no small anterior rudimentary rays, first ray very long, slender, filamentous and depressible a little beyond ventral origin, other rays all much shorter and graduated well down. Elongated dorsal ray about  $2\frac{1}{2}$  to caudal base?. Opposite middle of anal base a thin moderately long adipose fin, its length about  $1\frac{1}{3}$  eye-diameters. Caudal well forked or emarginate (damaged), and lobes apparently equal. Anal with base produced or elevated, fin inserted near last fourth in space between its origin and head, first ray apparently longest, others all graduated down. Pectoral with its base but slightly inclined, broad, and fin directed obliquely up posteriorly (damaged), and apparently reaching a little beyond dorsal origin. Ventral inserted near first third in space between pectoral origin and caudal base, fin long (damaged), rays apparently graduated anteriorly to middle, or longest, though last filamentous and depressible  $\frac{2}{3}$  to anal origin. Vent close before anal, not opening from elevated anal base, but from abdominal surface.

Color in alcohol largely faded dull or pale brown, nearly uniform, except blackish of belly or under surface. Photophores each with a little brownish or dusky pigment. Iris pale slaty.

Length  $4\frac{7}{8}$  inches (caudal tip damaged).

Italy (C. L. Bonaparte No. 348). From Dr. T. B. Wilson. I extracted a scopelid about an inch long from this example.

Head about  $6\frac{1}{3}$ ; head depth about  $6\frac{1}{2}$ ; D. 7; A.?; P. 13; V. 7. Teeth in premaxillary differ a little from those in above example in having an accessory fang close, similar, or very little shorter, beginning at base of second fang on left side. Base of second right premaxillary fang short, and similar to one depressible from base of first premaxillary fang, this latter of course transversely across roof of mouth. Also small similar accessory fang close behind

base of third right premaxillary fang. On each premaxillary on outer surface and outwardly inclined, about midway between second and third normal erect fangs a short slender conic tooth. Still another posterior, or about opposite base of accessory fang to third erect normal fang. Left mandibular ramus with short accessory conic cusp just behind each tooth, except first, and last teeth as 3 small short cusps. Each palatine with 6 conic erect teeth anterior, largest about  $\frac{1}{2}$  length of longest maxillary cusp, and others all graduated down smaller. Branchiostegals 20 each side. Photophores from isthmus to hind pectoral base 12, from latter to ventral origin 17, from latter to anal 24, from anal origin to caudal base 12. Upper enlarged lateral photophores 18 to ventral, and 26 from ventral to anal. Photophores otherwise as in preceding example. Length (caudal damaged) 7 inches. Same data as above example.

I have given the above detailed account of these specimens of this scarce deep-sea fish as the striking features of variation in some of the structural characters have not been noted before. My examples show the rudimental median mental barb but slightly, probably because both are in poor preservation. There are several points at variance with Bonaparte's figure,<sup>9</sup> he showing 62 scales in the lateral line, for instance.

#### AULOPIDÆ.

*Aulopus filamentosus* (Bloch).

Six from Italy.

*Chlorophthalmus agassizi* Bonaparte.

Icon. Faun. Ital., Pesc. III, pt. 1, XXVIII, 1840, descr., Pl., fig. 2. Italy.

No. 7,939 (type) to 7,954, A. N. S. P., cotypes of *C. agassizi* Bonaparte.

#### SYNODONTIDÆ.

*Trachinocephalus myops* (Schneider).

One from Yokohama, Japan.

*Synodus saurus* (Linnaeus).

Five from Italy.

*Synodus fœtens* (Linnaeus).

Many examples, from: Beesley's Point, Longport, Atlantic City and Corson's Inlet, N. J.; Ft. Macon, N. C.; S. Carolina; Bayport and Marquesas Keys, Fla.

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<sup>9</sup> *Chauliodus setinotus* Bonaparte, *Icon. Faun. Ital.*, Pesc. III, pt. 1, XXX, 1841, descr., Pl., fig. 2.

***Synodus intermedius* (Agassiz).**

A dry skin from St. Croix, W. I.

***Synodus luciocephus* (Ayres).**

One from San Francisco and another likely from California?.

***Synodus dominicensis* sp. nov. Fig. 2.**

Head  $3\frac{2}{3}$ ; depth  $6\frac{1}{4}$ ; D. II, 9, 1; A. 10, 1; P. 1, 11; V. 1, 6, 1; scales in l. l. 43+6; 4 scales above l. l.; 6 scales below l. l.; 14 predorsal scales; head width  $2\frac{1}{5}$  its length; head depth at occiput  $2\frac{1}{3}$ ; mandible  $1\frac{2}{5}$ ; first branched dorsal ray  $1\frac{2}{5}$ ; third anal ray  $2\frac{3}{4}$ ; least depth of caudal peduncle  $4\frac{1}{5}$ ; caudal  $1\frac{2}{5}$ ; pectoral  $2\frac{1}{6}$ ; ventral  $1\frac{2}{5}$ ; snout  $3\frac{3}{4}$  in head measured from upper jaw tip; eye 4; premaxillary  $1\frac{2}{3}$ ; interorbital  $4\frac{3}{4}$ .

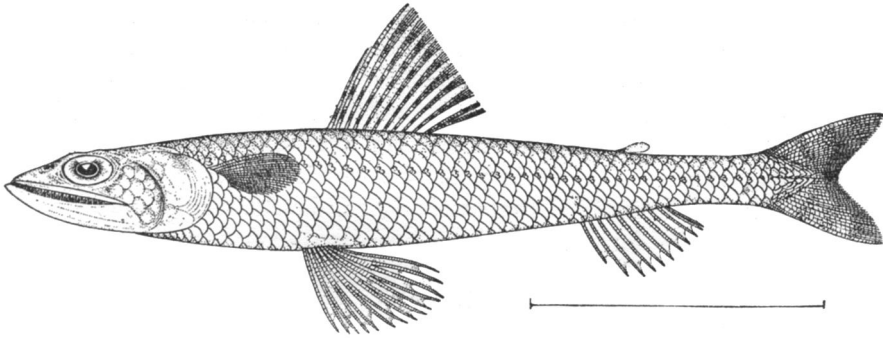


Fig. 2.—*Synodus dominicensis* Fowler. Type.

Body elongated, rather slender, apparently deepest about dorsal origin and though trunk now compressed this may be due to preservation?. Trunk seems to taper each end from greatest depth. Caudal peduncle now compressed, least depth half its length.

Head elongated, depressed above, lower profile little more evenly convex than upper, sides somewhat constricted below. Snout with slight concave profile, depressed, surface generally convex, length about  $\frac{5}{6}$  its basal width. Eye a little ellipsoid, impinging on upper profile, about first  $\frac{2}{5}$  in head. Mouth large, a little inclined. Pre-maxillary slender, extends beyond eye about  $\frac{1}{3}$  eye-diameter, and greatest expansion about 6 in eye. Lips thin, not concealing entirely single series of erect firm sharp compressed elongated premaxillary teeth. Another series of similar longer depressible teeth along upper jaw edge inside maxillary series. Mandibular teeth similar, triserial, outer series smallest and firm, and 2 inner series depressible with innermost largest. Teeth not united across symphysis of

either jaw in front. Palatine teeth biserial, inner series elongated, larger and depressible, and outer mostly firm and erect. Otherwise no teeth on mouth roof. A few minute asperities on upper pharyngeal region. Tongue triangular, free in front, with 2 rows of slightly depressible backwardly directed teeth above, and continued back over surface of basibranchial arch above where much smaller. Mandible surface convex, rami not elevated but tapering to slight fleshy symphyseal knob which projects slightly beyond snout tip. Nostrils together, about last third in snout, and anterior without cutaneous flap. Interorbital slightly concave. Anterosupraorbital ridge well developed. Postorbital quite narrow, surface roughened. Upper naked surface of head behind eyes with few striæ and ridges, little roughened. Preopercle ridge curving back and more convexly below, where at least  $\frac{2}{3}$  of eye distant from latter. Opercle width  $1\frac{1}{2}$  its depth.

Gill-opening extends forward about opposite hind eye edge. Rakers minutely spinescent, numerous, much smaller than filaments. Latter about 3 in eye. Pseudobranchiæ a little less than filaments. Isthmus narrowly constricted, trenchant. Branchiostegals 16, slender.

Scales moderately large, cycloid, well exposed, edges entire, in longitudinal series parallel with l. l., smaller on caudal base except elongated flap at middle of each lobe basally, where elongate. Axillary ventral flap?. L. l. complete, straight from shoulder to caudal base medianly, tubes simple, and small exposed crimped scale at base of each scale in course anteriorly. Cheek scales in 4 rows. Opercle, subopercle and interopercle scaly.

Dorsal origin trifle nearer origin of adipose fin than snout tip, first branched ray longest and depressible behind far as tip of last branched ray at least, fin 3 to caudal base. Adipose fin inserted about midway between depressed dorsal tip and caudal base, fin about 5 to latter. Caudal forked nearly half its length, free pointed tips nearly equal. Anal inserted about midway between dorsal base centre and caudal base, third ray longest. Pectoral short, inserted nearly midway between eye centre and dorsal origin, fin reaches ventral origin. Latter inserted about last fourth between pectoral and dorsal origins, fin  $1\frac{1}{2}$  to anal, outermost and innermost rays simple, others branched, and membranes of all latter deeply notched externally. Vent close in front of anal.

Color in alcohol largely faded dull brownish, paler below. Back with traces of fine and slightly darker mottlings made up of small



spots and lines. Head brownish above, paler below. Scapular arch above with several faded small dark brown spots. Each dorsal ray with 5 deep brown spots, rest of fin pale. Caudal pale, except about 3 diffuse brownish shades over each lobe along inner edge. Other fins all pale, unicolor. Iris coppery.

Length  $3\frac{1}{16}$  inches.

Type, No. 15,883, A. N. S. P. Santo Domingo, W. I. William M. Gabb.

This species seems to be closely related to *Synodus poeyi* Jordan, differing in the longer premaxillary, ventrals reaching less close to vent, smaller pectoral and the barred dorsal fin.

(Named for Santo Domingo.)

*Synodus dermatogenys* sp. nov. Fig. 3.

Head  $3\frac{1}{2}$ ; depth  $6\frac{1}{2}$ ; D. 11, 10, 1; A. 10, 1; P. 1, 12; V. 1, 6, 1; scales in l. l.  $64 + 4$ ; 5 scales above l. l.; 7 scales below l. l.; 20 predorsal scales; head width  $2\frac{1}{8}$  its length; head depth at occiput

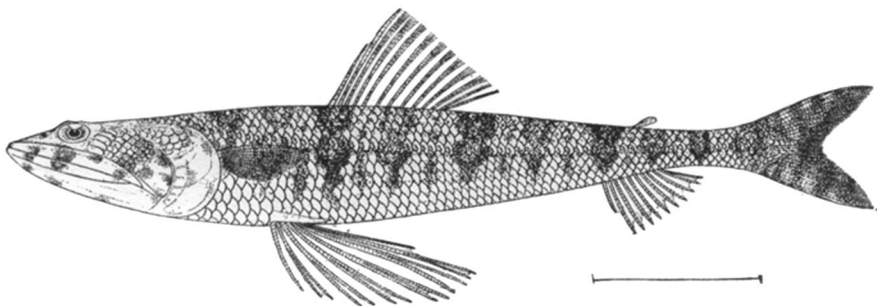


Fig. 3.—*Synodus dermatogenys* Fowler. Type.

$2\frac{1}{10}$ ; snout  $4\frac{1}{4}$ ; eye  $6\frac{1}{2}$ ; premaxillary  $1\frac{2}{7}$ ; interorbital 6; mandible  $1\frac{1}{3}$ ; first branched dorsal ray  $1\frac{4}{5}$ ; second anal ray  $3\frac{2}{5}$ ; least depth caudal peduncle 6; upper caudal lobe  $1\frac{2}{3}$ ; pectoral  $2\frac{1}{4}$ ; ventral 1.

Body elongate, nearly cylindrical or edges all convex, apparently deepest about dorsal origin. Caudal peduncle cylindrical, least depth about  $2\frac{3}{4}$  its length.

Head depressed, lower profile more inclined, though slightly less convex than upper, sides converging below. Snout depressed, profile straight, surface convex, length about  $\frac{3}{4}$  its width. Eye a little ellipsoid, impinging on upper profile, about first  $\frac{2}{7}$  in head. Mouth well inclined, with firm jaws, large. Premaxillary broad, extends beyond eye about  $1\frac{1}{2}$  eye-diameters, greatest median expan-

sion 2 in eye. A series of firm erect sharp-pointed slender teeth concealed by lip along premaxillary, inside another series of longer depressible ones, all directed at least a little forward. Mandible with similar teeth, outer series smallest, but 2 inner rows both depressible and of these inside row longest of all. Palatines with 2 rows of small slender teeth, inner longer and more depressible. Band of teeth in jaws and on palatines not continuous in front. Tongue triangular, rather narrow, free in front, with about 6 rows of irregular slender pointed and depressible teeth. These continued back on basibranchial arch as more narrow band, and all teeth much smaller. Mandible low, surface convex and tip little short of snout tip. Nostrils together, near last fourth in head, anterior with small flap, apparently not fringed. Interorbital well concave. Post-orbital width about 2 in eye. Hind preopercle ridge a little more curved back below, where about an eye-diameter distant from hind premaxillary edge. Opercle width about half its length. Upper suprascapular edge entire. Anterosupraorbital processes well developed. Cranium roughly striate and rugose.

Gill-opening forward trifle before middle in head. Rakers as minute fine denticles, numerous, sharp. Filaments  $1\frac{1}{5}$  in eye. Pseudobranchiæ little smaller than filaments. Isthmus narrowly constricted, slender. Branchiostegals about 17, slender.

Scales in even longitudinal series parallel with l. l., axis of each well inclined posteriorly, all rather narrowly exposed, edges entire, reduced and smaller on breast and caudal base, latter with 2 elongated flaps, one at base of each lobe. Pointed free slender axillary ventral scaly flap,  $3\frac{1}{2}$  in fin. Cheek scales in 7 series, lower hind portion for nearly half its area naked. Opercles below naked, only few scales above. L. l. complete, sloping gently from shoulder to median caudal-base, each scale in its course marked by small accessory basal or crimped scale.

Dorsal origin a little nearer adipose fin origin than snout tip, first branched ray longest, but only extending about first fourth in length of last, fin  $2\frac{1}{2}$  to caudal base. Adipose fin small, inserted about midway between dorsal tip and caudal base, fin 5 to latter. Anal inserted about midway between last dorsal ray base and caudal base, fin  $1\frac{3}{4}$  to latter, first branched ray longest, fin edge below notched. Caudal deeply forked, sharp-pointed lobes about equal. Pectoral short, reaches  $\frac{1}{5}$  to dorsal origin. Ventral inserted before pectoral tip, trifle nearer pectoral than dorsal origin, depressed fin  $1\frac{2}{3}$  to anal, with innermost branched ray longest. Vent about  $\frac{2}{3}$  an eye-diameter before anal.

Color in alcohol pale brownish generally, but slightly dark above, or more grayish. About 6 rather broad deeper gray-brown transverse saddles across back, each obscurely edged in front and behind with deeper or more dusky, and edges of scales within each all darker than ground color. Alternating are 5 paler and narrower similar saddles. Alternating still, between darker and paler saddles, other lighter and more obsolete streaks, mostly broken into obscure pale blotches. All lateral saddles become constricted above l. l. where they appear as hour-glass-shaped ocelli, lower bulge of each continued down as dark streak short distance each side of abdomen. Between are slightly paler streaks continued from palest alternating streaks of back, though these mostly with detached appearance. Jaws with 3 broad deep brown transverse bands, paler below. Head above, and cheek, mottled deep brown. Each dorsal ray with about 4 obscure brown blotches. Each caudal lobe with about 5 transverse deep brown bands, narrower at rudimentary rays and posterior wider. Fins otherwise all pale or brownish. Iris brownish.

Length  $5\frac{3}{8}$  inches.

Type, No. 28,130, A. N. S. P. Hawaiian Islands. From the U. S. F. Com. in 1901.

Also Nos. 28,131 to 28,134, paratypes, same data. Head  $3\frac{1}{8}$  to  $3\frac{4}{7}$ ; depth  $6\frac{2}{7}$  to 7; D. II, 10, I or II, 11, I; A. 8, I or 9, I; scales in l. l. 60 to 62 + 4; usually 6, sometimes 5, scales above l. l.; usually 6, sometimes 7, scales below l. l.; usually 18 predorsal scales, sometimes 19 or 20; snout  $4\frac{1}{4}$  to  $4\frac{1}{2}$  in head; eye 6 to  $6\frac{2}{5}$ ; maxillary  $1\frac{1}{2}$  to  $1\frac{2}{3}$ ; interorbital  $5\frac{1}{8}$  to  $6\frac{1}{4}$ ; length  $5\frac{1}{16}$  to  $5\frac{3}{4}$  inches.

This species is closely related to *Saurus variegatus* Quoy and Gaimard, whose plate quite agrees with the figure of *Synodus varius* by Jordan and Evermann,<sup>10</sup> in having the cheek entirely covered with large scales. *Synodus dermatogenys* differs from *Synodus variegatus* in having the posterior portion of the cheek naked. Lacépède's *Salmo varius* has been considered identical with *Cobitis japonica* Houttuyn by Jordan and Herre,<sup>11</sup> the latter evidently having in mind the Hawaiian material identical with the figure of *Synodus varius* of Jordan and Evermann. As I shall later show that *Synodus sharpi* Fowler is a *Saurida*, the present species seems justified in bearing a new name.

(*Δέρμα*, skin; *γέγων*, cheek; with reference to the lower cheek being naked.)

<sup>10</sup> *Bull. U. S. F. Com.*, XXIII, pt. 1, 1903 (1905), p. 63, fig. 14.

<sup>11</sup> *Proc. U. S. Nat. Mus.*, XXXII, 1907, p. 516.

**Saurida tumbil** (Bloch).

Three from Padang, Sumatra, one of which now in Stanford University.

**Saurida gracilis** (Quoy and Gaimard).

*Synodus sharpi* Fowler, Proc. Acad. Nat. Sci. Phila., 1900, p. 497, Pl. 19, fig. 2. Sandwich Islands.

Nos. 16,084 (type) to 16,086, A. N. S. P. Type and paratypes of *S. sharpi* Fowler. These examples were first wrongly identified by Jenkins<sup>12</sup> with *Salmo varius* Lacépède, and afterwards the error was perpetuated by Jordan and Evermann,<sup>13</sup> Günther,<sup>14</sup> and Jordan and Herre.<sup>15</sup> In 1900 I wrongly identified two Hawaiian examples of this species as *Saurida tumbil*.<sup>16</sup> Besides the above material there are four examples in the collection from Hilo. I may here state that my paper containing the description of *Synodus sharpi* very evidently has priority over that by Steindachner<sup>17</sup> in Schausland's collection. Only a synopsis of the new species<sup>18</sup> from Hawaii was published by Steindachner in 1900, the complete account being reserved till later. The actual date of publication for my paper was November 6, 1900, while the volume containing Steindachner's full account is not mentioned until the meeting of March 13, 1902, at the Vienna Academy,<sup>19</sup> and it was not received in the library of the Academy of Natural Sciences of Philadelphia until October 31, 1902.

**Harpadon nehereus** (Hamilton-Buchanan).

One from Padang, Sumatra.

**MYCTOPHIDÆ.****Ceratoscopelus maderensis** (Lowe).

One labeled "Atlantic Ocean" (Tyson) from the stomach of a shark. Also 5 from N. Lat. 36° 24' W. Long. 71° 24'.

**Lampanyotus gemellarii** (Cocco).

Two from Italy (Bonaparte).

**Lampanyotus crocodilus** (Risso).

Two from Italy (Bonaparte).

**Nannobranchium maconaldi** Goode and Bean.

Ocean Ich., 1895, p. 94, fig. 110. N. Lat. 39° 44' 30'' W. Long. 71° 04' in 1,022 fathoms.

No. 7,978, A. N. S. P., paratype, with above data.

<sup>12</sup> Bull. U. S. F. Com., XXII, pt. 1, 1902 (1903), p. 433.

<sup>13</sup> L. c., XXIII, pt. 1, 1903 (1905), p. 63 (65).

<sup>14</sup> Journ. Mus. Godef., XVI, 1909, p. 376.

<sup>15</sup> Proc. U. S. Nat. Mus., XXXII, 1907, p. 516.

<sup>16</sup> Proc. Acad. Nat. Sci. Phila., 1900, p. 497.

<sup>17</sup> Denk. Ak. Wiss. Wien, LXX, 1901, p. 513.

<sup>18</sup> Anz. Ak. Wiss. Wien, XXXVII, 1900, pp. 174-178.

<sup>19</sup> L. c., XXXIX, 1902, p. 77.

***Æthoprora metopoclampa*** (Cocco).

One from Italy (Bonaparte).

***Collettia rafinesquii*** (Cocco).

Two from Italy (Bonaparte).

***Rhinoscopelus cocco*** (Cocco).

One from Italy (Bonaparte); one from off Havre, France (Jones); 5 from between Norfolk, Cape de Verde Islands and Montevideo, Uruguay, in 1891-92 at the surface (Rush); 2 from S. Lat. 20° W. Long. 75° (Sharp); 5 from N. Lat. 39° 50' 45'' W. Long. 71° 43' at the surface (U. S. F. C.); 1 without locality (Jones).

***Centrobranchus chærocephalus*** Fowler.

Proc. Acad. Nat. Sci. Phila., 1903, p. 754. Near the Sandwich Islands.

Nos. 7,972 (type) to 7,977 (paratypes), A. N. S. P., of which one now in Stanford University.

***Electrona risso*** (Cocco).

One from Italy (Bonaparte).

***Myctophum punctatum*** Rafinesque.

Four from Italy (Bonaparte). The example from the Atlantic between Greenland and N. America in 60° N. Lat., I recorded as *M. phengodes*,<sup>20</sup> is also identical.

***Myctophum affine*** (Lütken).

One from Lat. N. 8° 37' Long. W. 168° (Jones); and 2 without locality (Jones); 1 no data; 1 from Lat. N. 5° 11' Long. W. 151° (Jones); 2 from between Norfolk in Cape de Verde Islands and Montevideo, Uruguay, in 1891-92 at the surface (Rush).

***Myctophum hygomi*** (Lütken).

One from Lat. N. 36° 45' W. Long. 74° 28' 30'' (U. S. F. C.), at the surface probably.

***Myctophum reinhardti*** (Lütken).

One from Lat. S. 20° Long. W. 75° (Sharp).

***Benthosema mülleri*** (Gmelin).

One from Lat. N. 40° 4' 20'' Long. W. 68° 43' 50'' in 373 fathoms (U. S. F. C.).

#### MAUROLICIDÆ.

***Ichthyococcus ovatus*** (Cocco).

Three from Italy (Bonaparte).

***Maurolicus attenuatus*** (Cocco).

Four from Italy (Bonaparte).

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<sup>20</sup> *Proc. Acad. Nat. Sci. Phila.*, 1901, p. 620.

**PLAGYODONTIDÆ.**

**Plagyodus ferox** (Lowe).

One young from N. Lat. 5° W. Long. 164° (Jones), evidently this species.

**PARALEPIDÆ.**

**Sudis hyalina** Rafinesque.

Two from Italy (Bonaparte).

**Paralepis pseudocoregonoides** Serato.

One from Italy (Bonaparte).

**Paralepis barracudina** Fowler and Phillips.

Proc. Acad. Nat. Sci. Phila., 1910, p. 403, fig. Corson's Inlet, N. J.

No. 37,627, A. N. S. P., type.

**STERNOPTYCHIDÆ.**

**Argyropelecus hemigymnus** Cocco.

Seven from Italy (Bonaparte).